REMARKS

The present application has claims 1-3 and 5-17 pending. Claims 12-15 have been withdrawn from consideration in the present application for allegedly being directed to a separate and distinct invention than that of the remaining claims. No amendments have been made in the present response.

In the July 25, 2008 Office Action, the Examiner rejected claims 1-7 and 16-17 under 35 USC §103(a) as allegedly obvious over Barton, et al., U.S. Patent Publication No. 2003/0157397 in view of Fuglevand, et al., U.S. Patent Publication No. 2004/0214057 and further in view of Mizuno, U.S. Patent Publication No. 2002/0150810. Claims 8-11 were also rejected over Barton, et al. in view of Fuglevand, et al. and Mizuno, and even further in view of Lertola, U.S. Patent Publication No. 2005/0255372.

In the Office Action, the Examiner admits that the Barton, et al. reference does not disclose a membrane electrode unit having gas distribution layers (GDLs) with different sizes. That is, the reference fails to teach the limitation in claim 1 requiring that the first GDL have surface dimensions smaller than those of the membrane while the second GDL have dimensions substantially equal to those of the membrane. Furthermore, the Examiner admits that Barton, et al. fails to disclose or teach a membrane electrode unit wherein a portion of the membrane is not supported by the gas distributor substrate, as required by claim 1 of the present application.

With respect to these absent teachings of Barton, et al., Applicants agree with the Examiner. Essentially, Barton, et al. is directed to a coextensive design (see, for example, Figure 2 of Barton, et al.), similar to the design shown in comparative example 1 of the present application.

The Examiner attempts to provide for the missing teachings in Barton, et al. by citing two new references: Fuglevand, et al. and Mizuno. The combining of the Barton, et al. reference with Fuglevand, et al. and Mizuno is improper for a number of reasons. First, the combining of the references is done with hindsight. There is no suggestion in any of the references which would motivate a person skilled in the field to combine the references in the manner suggested by the Examiner.

More importantly, even if the references are combined in the manner suggested by the Examiner, one does not reach the present invention. Simply put, the limitation of claim 1 requiring that one of the gas distributor substrate has <u>surface dimensions smaller than those of the membrane</u> and the other gas distributor substrate has <u>surface dimensions substantially equal to those of the membrane</u> is not found in any of the cited references, nor in their combination.

The Fuglevand, et al. reference discloses a **<u>coextensive</u>** design (see, e.g., figures 9 and 11, membrane 80 and GDLs 100). Contrary to the assertions of the Examiner,

Fuglevand, et al. does **NOT** teach or disclose the use of gas distributor substrates having different dimensions.

Fuglevand, et al. teaches in paragraph 39 (the paragraph cited by the Examiner) the use of gas diffusion layers having variable hydrophobicity, **not variable dimensions** as alleged by the Examiner:

> [0039] As best illustrated in FIGS. 1-4, it will be seen that the outwardly facing surface 24 of each gas diffusion layer 22 defines a major surface 25. In the present invention, at least one of the gas diffusion layers 22 located on the anode or cathode side 12 and 13 has a hydrophobicity which varies when measured in a direction which is substantially along the major surface 25 and which facilitates the substantially optimal hydration of the ion exchange membrane 11 at typical fuel cell operating temperatures. For example, as seen in FIG. 1, the gas diffusion layer 22 which is juxtaposed relative to the anode side 12 and cathode side 13 of the ion exchange membrane 11 may both have a variable hydrophobicity. In the alternative, it is possible that only one of the anode or cathode sides has a variable hydrophobic gas diffusion layer 22. Still further in another form of the invention, the gas diffusion layer 22 may have a hydrophobicity which varies when measured in the X axis; Y axis; X and Y axes; and X, Y and Z axes. As should be understood by a study of FIGS. 1-4, the oxidant or cathode air stream 15 and fuel supplies 14 each have a direction of flow as indicated by the arrows relative to the major surface 25. As will appreciated, the hydrophobicity of the respective gas diffusion layers may vary when measured in substantially the same general direction of flow of the fuel supply 14; and/or oxidant supply 15. These directions of flow may be either linear, or non-linear.

(Fuglevand, et al., para. 39, emphasis added).

Applicants question the citation of Fuglevand, et al. because the reference does not disclose, teach or suggest the use of gas diffusion layers having different surface dimensions, and thus, does not provide any of the teachings missing from the Barton, et al. reference to achieve the present invention.

Likewise, the Mizuno reference fails to provide any of the missing teachings of the Barton, et al. reference. Mizuno discloses a conventional prior art design -- one that is discussed in the specification of the present application:

> Other design concepts for membrane electrode units are described in US 3,134,697 and EP 700 108 A2. These concepts are characterized by the fact that the membrane forms an edge that projects past the electrodes, and which is clamped between the cell plates and, if necessary, between other seals, when the electrodes are sealed.

(page 2, line 25-28).

The embodiments of Mizuno are directed to membrane electrode units wherein both gas diffusion layers have the same size -- see, for instance, numerals 24 and 26 in Mizuno figure 1; numerals 124 and 126 in figures 2-3; numerals 224 and 226 in figure 4; and numerals 324 and 326 in figure 6. Although Mizuno may disclose units wherein a portion of the membrane on both sides is not supported by the gas diffusion layers, the Mizuno embodiments are clearly different than the present invention. The presently claimed invention requires that one gas diffusion layer have surface dimensions smaller than those of the membrane and the other diffusion layer have surface dimensions substantially equal to those of the membrane. Additionally, in the present invention, a portion of one side of the membrane is not supported by a gas diffusion layer.

In sum, combining the teachings of Barton, et al., Fuglevand, et al. and Mizuno does not achieve the presently claimed invention. None of these reference disclose or teach the claim element that one gas diffusion layer have surface dimensions smaller than

those of the membrane and the other diffusion layer have surface dimensions substantially equal to those of the membrane. Combining three references, each missing this key claim element, cannot possibly render obvious to one skilled in the art an invention with this element.

With respect to the rejection of claims 8-11, the Examiner also cites Lertola in addition to Barton, et al., Fuglevand, et al. and Mizuno. Because claims 8-11 depend from, and contain all the limitations of, claim 1, the remarks set forth above pertaining to Barton, et al., Fuglevand, et al. and Mizuno are equally applicable to the rejection of these claims.

As to the Lertola reference, this reference also does not disclose or suggest the semi-coextensive design of the present invention or the claim limitation that one gas diffusion layer have surface dimensions smaller than those of the membrane and the other diffusion layer have surface dimensions substantially equal to those of the membrane. Accordingly, even if the Lertola reference is combined with the other cited references, the presently claimed invention would not be achieved.

In addition to failing to disclose or teach all the claim elements of the presently claimed invention, the cited references also fail to recognize or teach the objectives of the present invention. As outline in our previous replies, an objective of the present invention is to provide a better design concept compared to state of the art membrane

electrode units by (a) removing danger of short-circuiting and (b) providing gas-tight sealing to prevent hydrogen penetration (see for instance, page 3, line 24, to page 4, line 10, of the specification).

None of the cited references (Barton, et al., Fuglevand, et al., Mizuno or Lertola) even mentions aspect (a) -- the removal or reduction of the danger of short-circuiting. Likewise, the surprising result regarding aspect (b) is also not disclosed in the references. The superiority of the present invention is supported by comparative electrochemical tests determining open cell voltage (OCV) and hydrogen penetration current (HPC) in comparison to the state of the art designs (see table 1, page 1, of the specification). As can be seen in Table 1, the HPC is improved by more than a factor of 4 compared to the state-of the art designs. This leads to a significant improvement in fuel cell performance.

In light of the amendments and remarks above, Applicants request reconsideration and withdrawal of the rejections under 35 U.S.C. §103(a) set forth in the July 25, 2008 Office Action and respectfully solicit allowance of the present application.

No fee is deemed necessary in connection with the filing of this amendment, other than the fee for the requested three-month extension of time. If any additional fees are due, or an overpayment has been made, please charge, or credit, our Deposit Account No. 11-0171 for such sum.

If the Examiner has any questions regarding the present application, the Examiner is cordially invited to contact Applicants' attorney at the telephone number provided below.

Respectfully submitted,

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